3

2D WORD PROBLEMS

2003B 11. A line with slope 3 intersects a line with slope 5 at the point $(10, 15)$. What is the distance between the x-intercepts of these two lines?

(A) 2 **(B)** 5 **(C)** 7 **(D)** 12 **(E)** 20

2007B 11. A circle passes through the three vertices of an isosceles triangle that has two sides of length 3 and a base of length 2. What is the area of this circle?

(A) 2π **(B)** $\frac{5}{2}\pi$ **(C)** $\frac{81}{32}\pi$ **(D)** 3π **(E)** $\frac{7}{2}\pi$

2011A 11. Square $EFGH$ has one vertex on each side of square $ABCD$. Point E is on $\overline{AB}$ with $AE = 7 \cdot EB$. What is the ratio of the area of $EFGH$ to the area of $ABCD$?

(A) $\frac{49}{64}$ **(B)** $\frac{25}{32}$ **(C)** $\frac{7}{8}$ **(D)** $\frac{5\sqrt{2}}{8}$ **(E)** $\frac{\sqrt{14}}{4}$

2012A 11. Externally tangent circles with centers at points A and B have radii of lengths 5 and 3, respectively. A line externally tangent to both circles intersects ray AB at point C. What is BC?

(A) 4 **(B)** 4.8 **(C)** 10.2 **(D)** 12 **(E)** 14.4

2016B

11. Carl decided to fence in his rectangular garden. He bought 20 fence posts, placed one on each of the four corners, and spaced out the rest evenly along the edges of the garden, leaving exactly 4 yards between neighboring posts. The longer side of his garden, including the corners, has twice as many posts as the shorter side, including the corners. What is the area, in square yards, of Carl's garden?

(A) 256 **(B)** 336 **(C)** 384 **(D)** 448 **(E)** 512

2006B

12. The lines $x = \frac{1}{4}y + a$ and $y = \frac{1}{4}x + b$ intersect at the point $(1, 2)$. What is $a + b$?

(A) 0 **(B)** $\frac{3}{4}$ **(C)** 1 **(D)** 2 **(E)** $\frac{9}{4}$

2012B

12. Point B is due east of point A. Point C is due north of point B. The distance between points A and C is $10\sqrt{2}$ meters, and $\angle BAC = 45°$. Point D is 20 meters due north of point C. The distance AD is between which two integers?

(A) 30 and 31 **(B)** 31 and 32 **(C)** 32 and 33 **(D)** 33 and 34

(E) 34 and 35

2015B

12. For how many integers x is the point $(x, -x)$ inside or on the circle of radius 10 centered at $(5, 5)$?

(A) 11 **(B)** 12 **(C)** 13 **(D)** 14 **(E)** 15

2017A

12. Let S be the set of points (x, y) in the coordinate plane such that two of the three quantities 3, $x + 2$, and $y - 4$ are equal and the third of the three quantities is no greater than this common value. Which of the following is a correct description of S?

(A) a single point **(B)** two intersecting lines

(C) three lines whose pairwise intersections are three distinct points

(D) a triangle **(E)** three rays with a common endpoint

2007B

13. Two circles of radius 2 are centered at $(2, 0)$ and at $(0, 2)$. What is the area of the intersection of the interiors of the two circles?

(A) $\pi - 2$ **(B)** $\frac{\pi}{2}$ **(C)** $\frac{\pi\sqrt{3}}{3}$ **(D)** $2(\pi - 2)$ **(E)** π

2015B 13. The line $12x + 5y = 60$ forms a triangle with the coordinate axes. What is the sum of the lengths of the altitudes of this triangle?

(A) 20 **(B)** $\frac{360}{17}$ **(C)** $\frac{107}{5}$ **(D)** $\frac{43}{2}$ **(E)** $\frac{281}{13}$

2008B 14. Triangle OAB has $O = (0,0)$, $B = (5,0)$, and A in the first quadrant. In addition, $\angle ABO = 90^\circ$ and $\angle AOB = 30^\circ$. Suppose that $\overline{OA}$ is rotated 90° counterclockwise about O. What are the coordinates of the image of A?

(A) $\left(-\frac{10}{3}\sqrt{3}, 5\right)$ **(B)** $\left(-\frac{5}{3}\sqrt{3}, 5\right)$ **(C)** $\left(\sqrt{3}, 5\right)$ **(D)** $\left(\frac{5}{3}\sqrt{3}, 5\right)$ **(E)** $\left(\frac{10}{3}\sqrt{3}, 5\right)$

2011A 14. A pair of standard 6-sided fair dice is rolled once. The sum of the numbers rolled determines the diameter of a circle. What is the probability that the numerical value of the area of the circle is less than the numerical value of the circle's circumference?

(A) $\frac{1}{36}$ **(B)** $\frac{1}{12}$ **(C)** $\frac{1}{6}$ **(D)** $\frac{1}{4}$ **(E)** $\frac{5}{18}$

2011B

14. A rectangular parking lot has a diagonal of 25 meters and an area of 168 square meters. In meters, what is the perimeter of the parking lot?

(A) 52 **(B)** 58 **(C)** 62 **(D)** 68 **(E)** 70

2012A

14. Chubby makes nonstandard checkerboards that have 31 squares on each side. The checkerboards have a black square in every corner and alternate red and black squares along every row and column. How many black squares are there on such a checkerboard?

(A) 480 **(B)** 481 **(C)** 482 **(D)** 483 **(E)** 484

2012B

14. Two equilateral triangles are contained in a square whose side length is $2\sqrt{3}$. The bases of these triangles are the opposite sides of the square, and their intersection is a rhombus. What is the area of the rhombus?

(A) $\frac{3}{2}$ **(B)** $\sqrt{3}$ **(C)** $2\sqrt{2}-1$ **(D)** $8\sqrt{3}-12$ **(E)** $\frac{4\sqrt{3}}{3}$

2016B

14. How many squares whose sides are parallel to the axes and whose vertices have coordinates that are integers lie entirely within the region bounded by the line $y = \pi x$, the line $y = -0.1$, and the line $x = 5.1$?

(A) 30 **(B)** 41 **(C)** 45 **(D)** 50 **(E)** 57

2001

15. A street has parallel curbs 40 feet apart. A crosswalk bounded by two parallel stripes crosses the street at an angle. The length of the curb between the stripes is 15 feet and each stripe is 50 feet long. Find the distance, in feet, between the stripes.

(A) 9 **(B)** 10 **(C)** 12 **(D)** 15 **(E)** 25

2013B

15. A wire is cut into two pieces, one of length a and the other of length b. The piece of length a is bent to form an equilateral triangle, and the piece of length b is bent to form a regular hexagon. The triangle and the hexagon have equal area. What is $\frac{a}{b}$?

(A) 1 **(B)** $\frac{\sqrt{6}}{2}$ **(C)** $\sqrt{3}$ **(D)** 2 **(E)** $\frac{3\sqrt{2}}{2}$

2017B

15. Rectangle $ABCD$ has $AB = 3$ and $BC = 4$. Point E is the foot of the perpendicular from B to diagonal $\overline{AC}$. What is the area of $\triangle ADE$?

(A) 1 **(B)** $\frac{42}{25}$ **(C)** $\frac{28}{15}$ **(D)** 2 **(E)** $\frac{54}{25}$